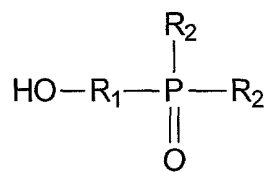


WHAT IS CLAIMED IS:

1. A mixture of hydroxyarylphosphine oxides comprising:

5 (a) a mono(hydroxyaryl)phosphine oxide of the formula:

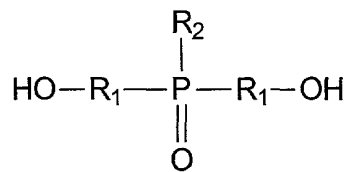


(I)

10 wherein R_1 is a divalent, substituted or unsubstituted arylene moiety and R_2 is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

(b) a bis(hydroxyaryl)phosphine oxide of the formula:

15

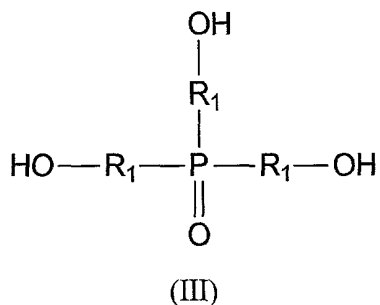


(II)

wherein R_1 and R_2 are defined as above; and

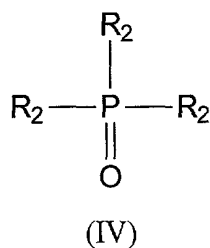
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(c) a tris(hydroxyaryl)phosphine oxide of the formula:



wherein R₁ is defined as above; and

(d) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:



wherein R₂ is defined as above.

2. The mixture according to Claim 1, wherein R₁ is derived from an alkyl aryl ether.

3. The mixture according to Claim 1, consisting essentially of diphenyl(4-hydroxyphenyl)phosphine oxide, bis(4-hydroxyphenyl)phenylphosphine oxide and tris(4-hydroxyphenyl)phosphine oxide, said mixture optionally including minor amounts of triphenylphosphine oxide.

4. The mixture according to Claim 1, consisting essentially of bis(4-methylphenyl)(4-hydroxyphenyl)phosphine oxide, bis(4-hydroxyphenyl)(4-

methylphenyl)phosphine oxide and tris(4-hydroxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(4-methylphenyl)phosphine oxide.

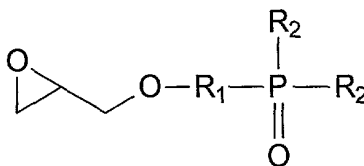
- 5 5. The mixture according to Claim 1, consisting essentially of bis(1-naphthyl)(4-hydroxyphenyl)phosphine oxide, bis(4-hydroxyphenyl)(1-naphthyl)phosphine oxide and tris(4-hydroxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(1-naphthyl)phosphine oxide.
- 10 6. The mixture according to Claim 1, consisting essentially of bis(2-naphthyl)(4-hydroxyphenyl)phosphine oxide, bis(4-hydroxyphenyl)(2-naphthyl)phosphine oxide and tris(4-hydroxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(2-naphthyl)phosphine oxide.
- 15 7. The mixture according to Claim 1, consisting essentially of bis(4-phenoxyphenyl)(4-hydroxyphenyl)phosphine oxide, bis(4-hydroxyphenyl)(4-phenoxyphenyl)phosphine oxide and tris(4-hydroxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(4-phenoxyphenyl)phosphine oxide.
- 20
8. The mixture according to Claim 1, consisting essentially of bis(2,4,5-trimethylphenyl)(4-hydroxyphenyl)phosphine oxide, bis(4-hydroxyphenyl)(2,4,5-trimethylphenyl)phosphine oxide and tris(4-hydroxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(2,4,5-
- 25 trimethylphenyl)phosphine oxide.
9. The mixture according to Claim 1, consisting essentially of bis(*tert*-butyl)(4-hydroxyphenyl)phosphine oxide, bis(4-hydroxyphenyl)(*tert*-butyl)phosphine

oxide and tris(4-hydroxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(*tert*-butyl)phosphine oxide.

- 5 10. The mixture according to Claim 1, wherein said mixture comprises from about 10 to about 50 mole percent of the mono(hydroxyaryl)phosphine oxide of the formula (I), from about 30 to about 60 mole percent of the bis(hydroxyaryl)phosphine oxide of the formula (II), from about 10 to 50 mole percent of the tris(hydroxyaryl)phosphine oxide of the formula (III) and from
10 about 0 up to about 10 mole percent of the pentavalent phosphine oxide of the formula (IV).

11. A mixture of glycidoxyarylphosphine oxides comprising:

- 15 (a) a mono(glycidoxyaryl)phosphine oxide of the formula:

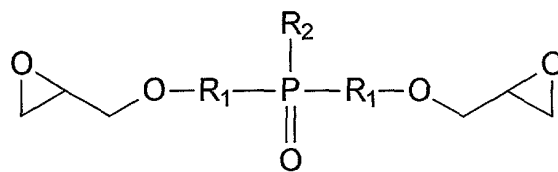


(VII)

- 20 wherein R₁ is a divalent, substituted or unsubstituted arylene moiety and R₂ is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

(b) a bis(glycidoxyaryl)phosphine oxide of the formula:

25

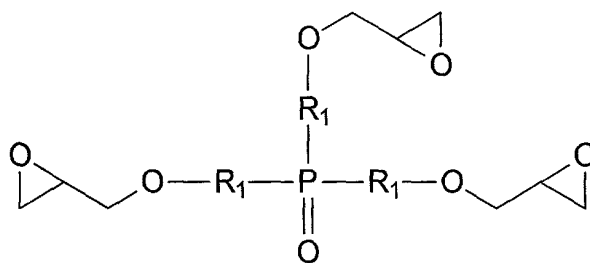


(VIII)

wherein R_1 and R_2 are defined as above; and

5

(c) a tris(glycidoxyaryl)phosphine oxide of the formula:



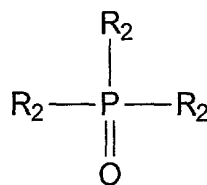
(IX)

10

wherein R_1 is defined as above; and

(d) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:

15



(IV)

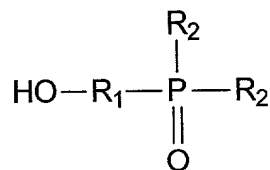
wherein R_2 is defined as above.

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12. The mixture according to Claim 11, consisting essentially of diphenyl(4-glycidoxyphenyl)phosphine oxide, bis(4-glycidoxyphenyl)phenylphosphine oxide and tris(4-glycidoxyphenyl)phosphine oxide, said mixture optionally including
5 minor amounts of triphenylphosphine oxide.
13. The mixture according to Claim 11, consisting essentially of bis(4-methylphenyl)(4-glycidoxyphenyl)phosphine oxide, bis(4-glycidoxyphenyl)(4-methylphenyl)phosphine oxide and tris(4-glycidoxyphenyl)phosphine oxide, said
10 mixture optionally including minor amounts of tris(4-methylphenyl)phosphine oxide.
14. The mixture according to Claim 11, consisting essentially of bis(1-naphthyl)(4-glycidoxyphenyl)phosphine oxide, bis(4-glycidoxyphenyl)(1-naphthyl)phosphine
15 oxide and tris(4-glycidoxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(1-naphthyl)phosphine oxide.
15. The mixture according to Claim 11, consisting essentially of bis(2-naphthyl)(4-glycidoxyphenyl)phosphine oxide, bis(4-glycidoxyphenyl)(2-naphthyl)phosphine
20 oxide and tris(4-glycidoxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(2-naphthyl)phosphine oxide.
16. The mixture according to Claim 11, consisting essentially of bis(4-phenoxyphenyl)(4-glycidoxyphenyl)phosphine oxide, bis(4-glycidoxyphenyl)(4-phenoxyphenyl)phosphine oxide and tris(4-glycidoxyphenyl)phosphine oxide,
25 said mixture optionally including minor amounts of tris(4-phenoxyphenyl)phosphine oxide.

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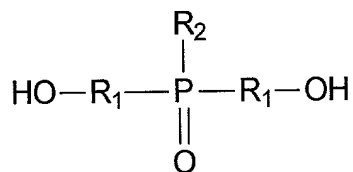
17. The mixture according to Claim 11, consisting essentially of bis(2,4,5-trimethylphenyl)(4-glycidoxyphenyl)phosphine oxide, bis(4-glycidoxyphenyl)(2,4,5-trimethylphenyl)phosphine oxide and tris(4-glycidoxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(2,4,5-trimethylphenyl)phosphine oxide.
18. The mixture according to Claim 11, consisting essentially of bis(*tert*-butyl)(4-glycidoxyphenyl)phosphine oxide, bis(4-glycidoxyphenyl)(*tert*-butyl)phosphine oxide and tris(4-glycidoxyphenyl)phosphine oxide, said mixture optionally including minor amounts of tris(*tert*-butyl)phosphine oxide.
19. The mixture according to Claim 11, wherein said mixture comprises from about 10 to about 50 mole percent of the mono(glycidoxyaryl)phosphine oxide derived from the phosphine oxide of the formula (I), from about 30 to about 60 mole percent of the bis(glycidoxyaryl)phosphine oxide derived from the phosphine oxide of the formula (II), from about 10 to 50 mole percent of the tris(glycidoxyaryl)phosphine oxide derived from the phosphine oxide of the formula (III) and from about 0 up to about 10 mole percent of the pentavalent phosphine oxide of the formula (IV).
20. An epoxy oligomeric product derived from a mixture of hydroxyarylphosphine oxides by way of reacting said mixture of hydroxyarylphosphine oxides with epichlorohydrin, said mixture of hydroxyarylphosphine oxides comprising:
- (a) a mono(hydroxyaryl)phosphine oxide of the formula:



(I)

wherein R_1 is a divalent, substituted or unsubstituted arylene moiety and R_2 is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

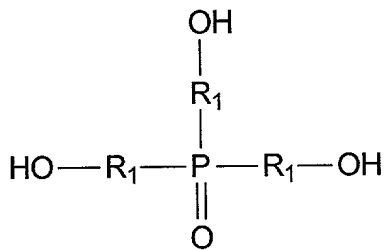
(b) a bis(hydroxyaryl)phosphine oxide of the formula:



(II)

wherein R_1 and R_2 are defined as above; and

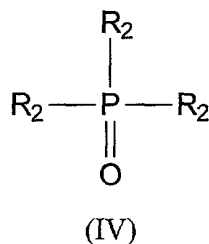
(c) a tris(hydroxyaryl)phosphine oxide of the formula:



(III)

wherein R_1 is defined as above; and

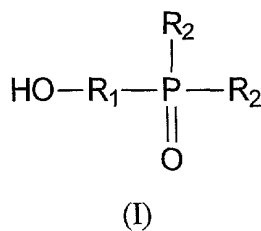
(d) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:



wherein R_2 is defined as above.

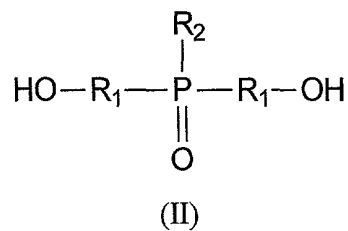
21. A flame retardant epoxy composition derived from a mixture of hydroxyarylphosphine oxides by way of reacting said mixture of hydroxyarylphosphine oxides with an epoxy resin composition, said mixture of hydroxyarylphosphine oxides comprising:

(a) a mono(hydroxyaryl)phosphine oxide of the formula:



wherein R_1 is a divalent, substituted or unsubstituted arylene moiety and R_2 is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

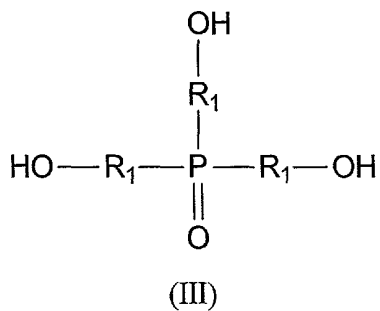
(b) a bis(hydroxyaryl)phosphine oxide of the formula:



5

wherein R_1 , R_2 are defined as above; and

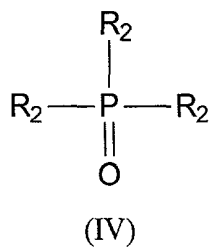
(c) a tris(hydroxyaryl)phosphine oxide of the formula:



10

wherein R_1 , is defined as above; and

15 (d) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:



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wherein R_2 is defined as above.

22. The epoxy composition according to Claim 21, further comprising a curing agent
5 and optionally including a filler and a diluent.
23. The epoxy composition according to Claim 22, wherein said curing agent is
selected from the group consisting of anhydrides, amines, amides, Lewis acids,
and phenolic based novolak resins.
10
24. The epoxy composition according to Claim 22, wherein said diluent is a glycidyl
ether.
25. A resin-impregnated composite comprising a reinforcing component and the
15 flame retardant epoxy composition according to Claim 21, at least partially cured.
26. The resin-impregnated composite according to Claim 25, including a glass filler, a
glass fiber or a glass fabric.
- 20 27. The resin-impregnated composite according to Claim 26, wherein said composite
includes a glass fabric.
28. A laminate, optionally including a copper foil layer adhered to the resin-
impregnated composite of Claim 25.
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29. A laminate, optionally including a copper foil layer adhered to the resin-
impregnated composite of Claim 26.

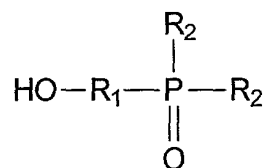
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30. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 27.

31. The laminate according to Claim 30, wherein said laminate includes a plurality of layers of resin-impregnated glass fabric, press-formed into a substantially integrated structure generally inseparable into its constituent layers.

32. A flame retardant curable composition comprising at least one component selected from the group consisting of: (i) an epoxy component derived from a mixture of hydroxyarylphosphine oxides by way of reacting said mixture of hydroxyarylphosphine oxides with a diglycidyl ether or mixture of diglycidyl ethers or polyglycidyl ethers; and (ii) a mixture of glycidyl ethers derived from said mixture of hydroxyarylphosphine oxides, said mixture of hydroxyarylphosphine oxides comprising:

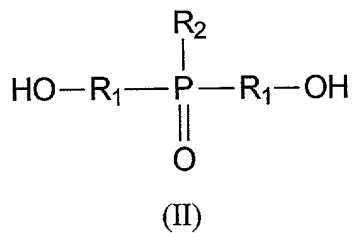
(a) a mono(hydroxyaryl)phosphine oxide of the formula:



(I)

wherein R₁ is a divalent, substituted or unsubstituted arylene moiety and R₂ is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

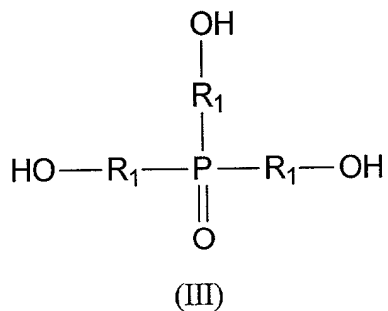
(b) a bis(hydroxyaryl)phosphine oxide of the formula:



wherein R_1 and R_2 are defined as above; and

5

(c) a tris(hydroxyaryl)phosphine oxide of the formula:

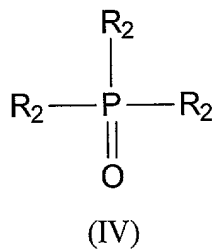


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wherein R_1 is defined as above; and

(d) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:

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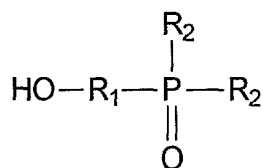


wherein R_2 is defined as above.

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33. The curable composition according to Claim 32, further comprising an epoxy resin based on epichlorohydrin and bisphenol A, bisphenol F, or a novolak epoxy resin.
- 5
34. The curable composition according to Claim 32, wherein at least one component is an oligomer derived from the reaction of said mixture of hydroxyarylphosphine oxides with a mixture of glycidyl ethers derived from said mixture of hydroxyarylphosphine oxides.
- 10
35. The curable composition according to Claim 32, further comprising a curing agent and optionally including a filler and a diluent.
- 15
36. The curable composition according to Claim 35, wherein said curing agent is selected from the group consisting of anhydrides, amines, amides, Lewis acids, and phenolic based novolak resins.
- 20
37. The curable composition according to Claim 35, wherein said diluent is a glycidyl ether.
38. A resin-impregnated composite comprising a reinforcing component and the flame retardant curable composition according to Claim 32, at least partially cured.
- 25
39. The resin-impregnated composite according to Claim 38, including a glass filler, a glass fiber or a glass fabric.
40. The resin-impregnated composite according to Claim 39, wherein said composite includes a glass fabric.

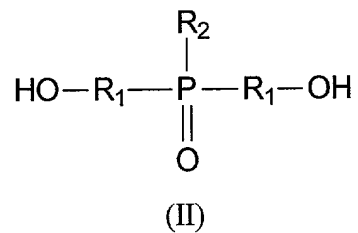
41. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 38.
42. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 39.
43. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 40.
44. The laminate according to Claim 43, wherein said laminate includes a plurality of layers of resin-impregnated glass fabric, press-formed into a substantially integrated structure generally inseparable into its constituent layers.
45. A flame retardant curable epoxy composition derived from a mixture of hydroxyarylphosphine oxides by way of reaction with an epoxy novolak composition or a bisphenol A or bisphenol F derived epoxy composition, said mixture of hydroxyarylphosphine oxides comprising:
- (a) a mono(hydroxyaryl)phosphine oxide of the formula:



(I)

wherein R_1 is a divalent, substituted or unsubstituted arylene moiety and R_2 is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

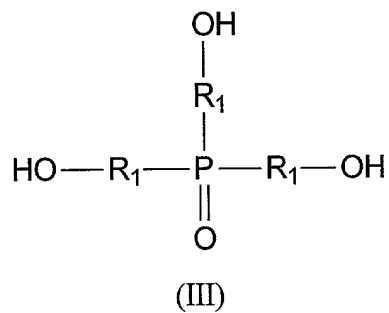
(b) a bis(hydroxyaryl)phosphine oxide of the formula:



5

wherein R₁ and R₂ are defined as above; and

(c) a tris(hydroxyaryl)phosphine oxide of the formula:

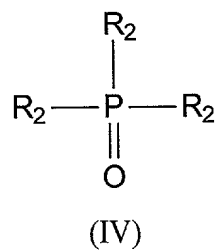


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wherein R₁ is defined as above; and

15

(d) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:



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wherein R_2 is defined as above.

46. The epoxy composition according to Claim 45, further comprising a curing agent
5 and optionally including a filler and a diluent.
47. The epoxy composition according to Claim 46, wherein said curing agent is
selected from the group consisting of anhydrides, amines, amides, Lewis acids,
and phenolic based novolak resins.
10
48. The epoxy composition according to Claim 46 wherein said diluent is a glycidyl
ether.
49. A resin-impregnated composite comprising a reinforcing component and the
15 flame retardant epoxy composition according to Claim 45, at least partially cured.
50. The resin-impregnated composite according to Claim 49, including a glass filler, a
glass fiber or a glass fabric.
- 20 51. The resin-impregnated composite according to Claim 50, wherein said composite
includes a glass fabric.
52. A laminate, optionally including a copper foil layer adhered to the resin-
impregnated composite of Claim 49.
25
53. A laminate, optionally including a copper foil layer adhered to the resin-
impregnated composite of Claim 50.

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54. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 51.

55. The laminate according to Claim 54, wherein said laminate includes a plurality of layers of resin-impregnated glass fabric, press-formed into a substantially integrated structure generally inseparable into its constituent layers.

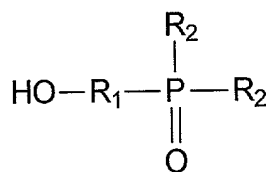
56. A method of making a mixture of hydroxyarylphosphine oxides comprising:

(a) preparing a mixed Grignard reaction mixture including the species $(R_1)MgX$ and $(R_2)MgX$ wherein R_1 is an arylalkylether radical and R_2 is an aryl or alkyl or aralkyl radical, X representing a halogen atom;

(b) reacting said mixed Grignard reaction mixture with phosphorous oxychloride to produce a mixture of arylalkyletherphosphine oxides; and

(c) converting said mixture of arylalkyletherphosphine oxides to a mixture of hydroxyarylphosphine oxides, wherein said mixture of hydroxyarylphosphine oxides includes:

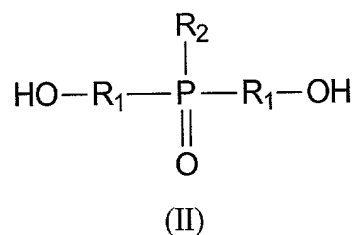
(i) a mono(hydroxyaryl)phosphine oxide of the formula:



(I)

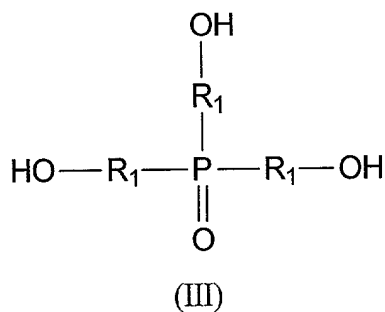
wherein R_1 is a divalent, substituted or unsubstituted arylene moiety and R_2 is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

5 (ii) a bis(hydroxyaryl)phosphine oxide of the formula:



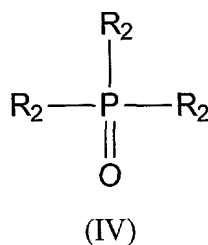
10 wherein R_1 and R_2 are defined as above; and

(iii) a tris(hydroxyaryl)phosphine oxide of the formula:



15 wherein R_1 is defined as above; and

20 (iv) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:



wherein R₂ is defined as above.

5

57. A method of making a mixture of hydroxyarylphosphine oxides comprising:

10

(a) preparing a Grignard reagent including the species (R₁)MgX wherein R₁ is an arylalkylether radical, X representing a halogen atom;

(b) preparing a Grignard reagent including the species (R₂)MgX wherein R₂ is an aryl or alkyl or aralkyl radical, X is defined as above;

15

(c) reacting said Grignard reagent (R₂)MgX with phosphorus oxychloride;

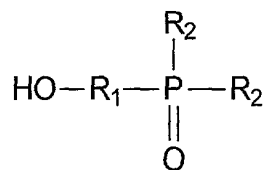
(d) after reaction of said Grignard reagent (R₂)MgX with phosphorous oxychloride, adding said Grignard reagent (R₁)MgX so as to produce a mixture of arylalkyletherphosphine oxides; and

20

(e) converting said mixture of arylalkyletherphosphine oxides to a mixture of hydroxyarylphosphine oxides, wherein said mixture of hydroxyarylphosphine oxides includes:

25

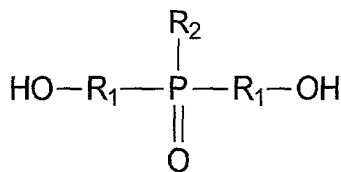
(i) a mono(hydroxyaryl)phosphine oxide of the formula:



(I)

wherein R₁ is a divalent, substituted or unsubstituted arylene moiety and
 R₂ is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl
 moiety or is an aralkyl moiety; and

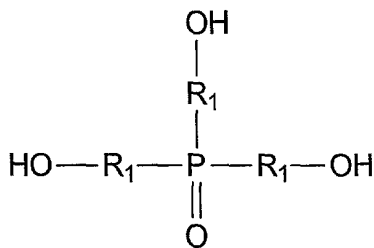
(ii) a bis(hydroxyaryl)phosphine oxide of the formula:



(II)

wherein R₁ and R₂ are defined as above; and

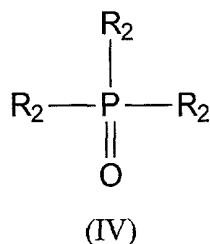
(iii) a tris(hydroxyaryl)phosphine oxide of the formula:



(III)

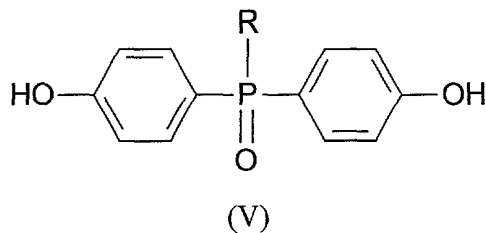
wherein R₁ is defined as above; and

- (iv) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:

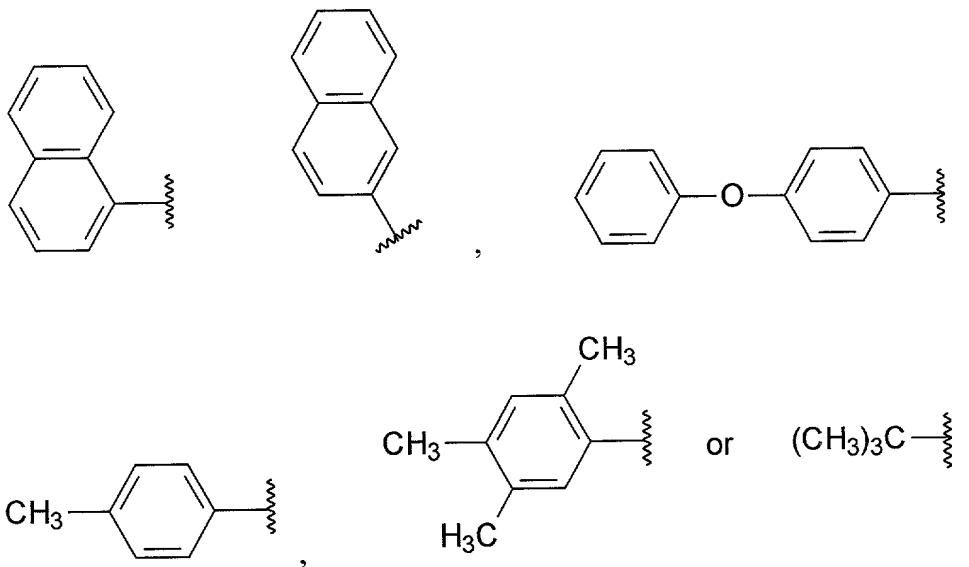


wherein R₂ is defined as above.

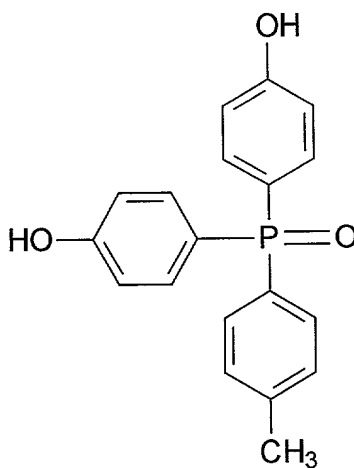
58. The method according to Claim 56, wherein said step of converting said mixture of arylalkyletherphosphine oxides to said mixture of hydroxyarylphosphine oxides includes treating said mixture with a mineral acid selected from the group consisting of HBr, HI and HCl in the presence of a metal halide salt.
59. The method according to Claim 57, wherein said step of converting said mixture of arylalkyletherphosphine oxides to said mixture of hydroxyarylphosphine oxides includes treating said mixture with a mineral acid selected from the group consisting of HBr, HI and HCl in the presence of a metal halide salt.
60. A bis(hydroxyphenyl)phosphine oxide of the formula:



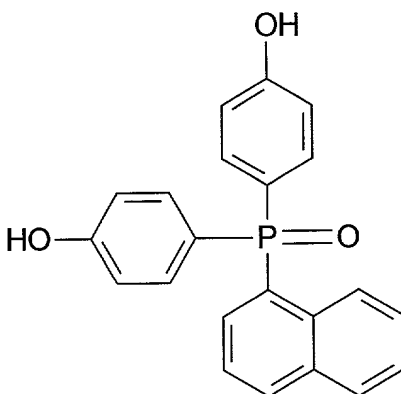
wherein -R is selected from the group consisting of



61. The bis(hydroxyphenyl)phosphine oxide according to Claim 60, having the structural formula:

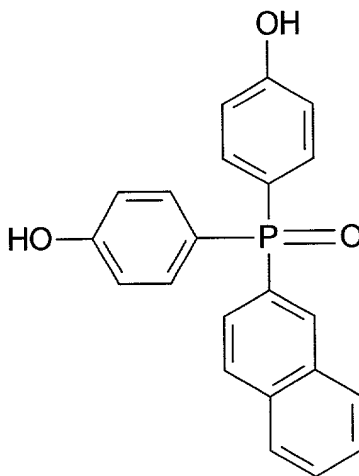


62. The bis(hydroxyphenyl)phosphine oxide according to Claim 60, having the structural formula:



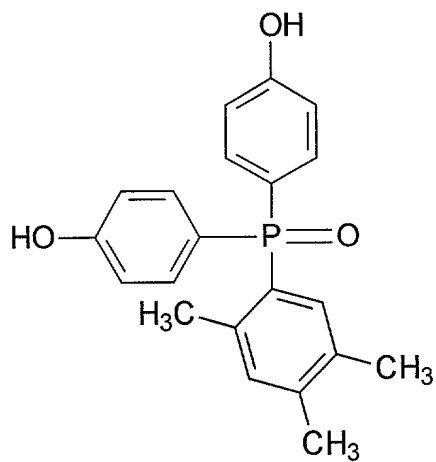
63. The bis(hydroxyphenyl)phosphine oxide according to Claim 60, having the
structural formula:

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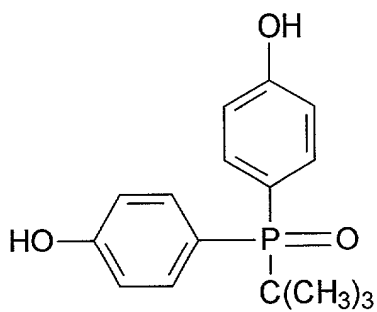


64. The bis(hydroxyphenyl)phosphine oxide according to Claim 60, having the
structural formula:

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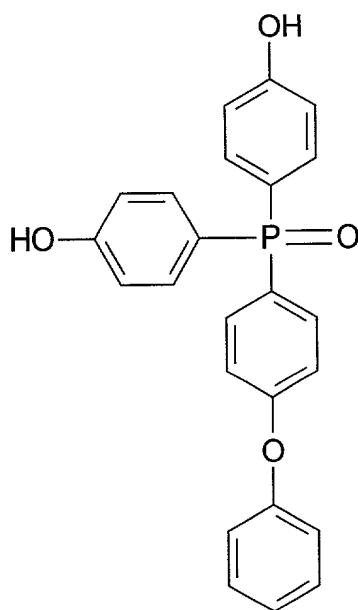


65. The bis(hydroxyphenyl)phosphine oxide according to Claim 60, having the structural formula:

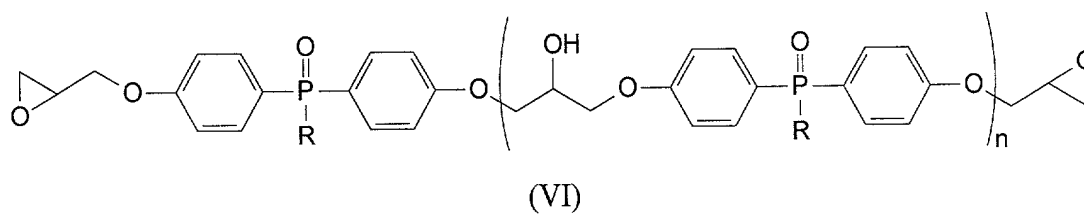


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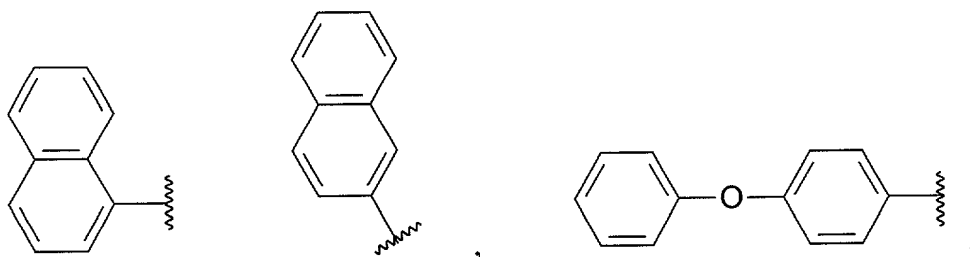
66. The bis(hydroxyphenyl)phosphine oxide according to Claim 60, having the structural formula:

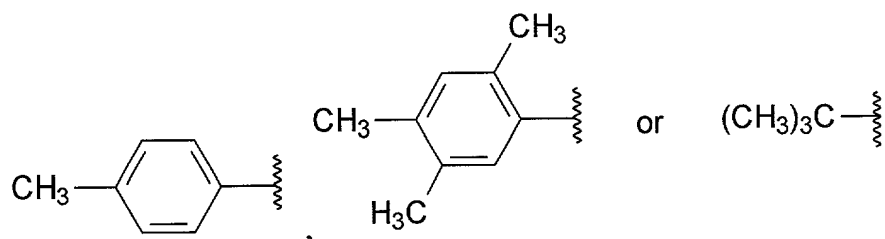


67. A diglycidyl ether of the formula:



wherein n is an integer from 0 to 100 and wherein $-R$ is selected from the group consisting of

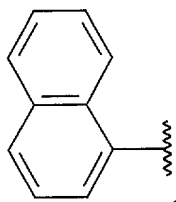




68. The diglycidyl ether according to Claim 67 wherein n is an integer from 0 to 20.

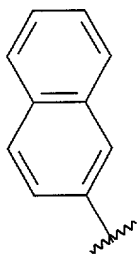
5 69. The diglycidyl ether according to Claim 67 wherein n is an integer from 0 to 5.

70. The diglycidyl ether according to Claim 67 wherein -R is



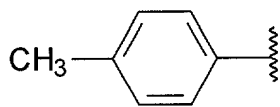
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71. The diglycidyl ether according to Claim 67 wherein -R is

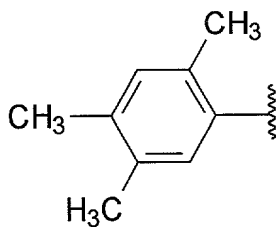


15 72. The diglycidyl ether according to 67 wherein -R is

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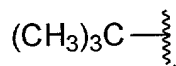


73. The diglycidyl ether according to Claim 67 wherein -R is

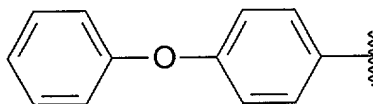


5

74. The diglycidyl ether according to Claim 67 wherein -R is

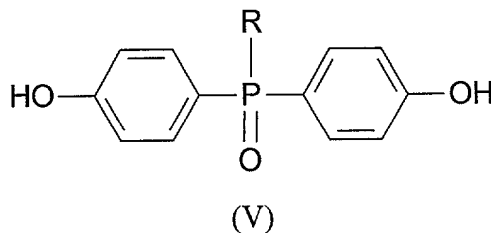


10 75. The diglycidyl ether according to Claim 67 wherein -R is

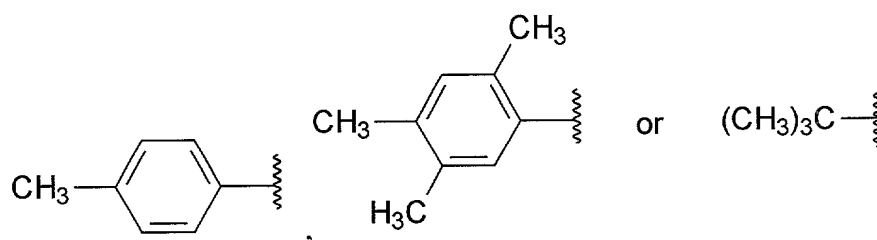
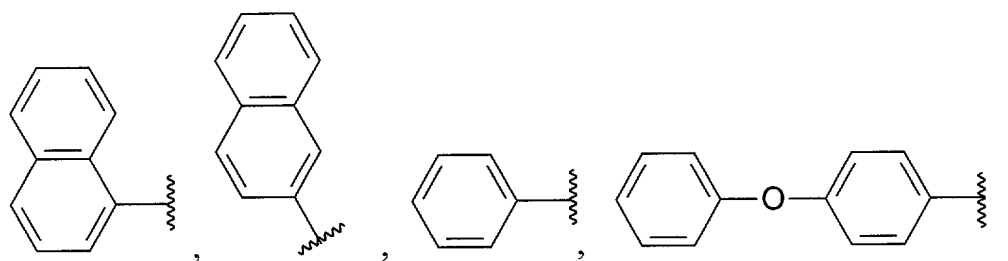


76. An epoxy composition derived from a bis(hydroxyphenyl)phosphine oxide of the formula:

15

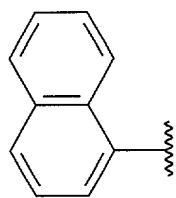


wherein -R is selected from the group consisting of



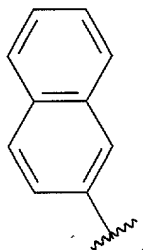
5 by way of reaction with an epoxy resin.

77. The epoxy composition according to Claim 76 wherein -R is

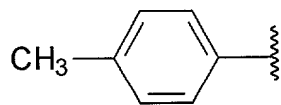


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78. The epoxy composition according to Claim 76 wherein -R is

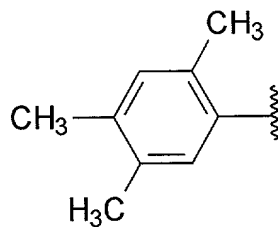


79. The epoxy composition according to Claim 76 wherein -R is



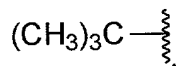
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80. The epoxy composition according to Claim 76 wherein -R is

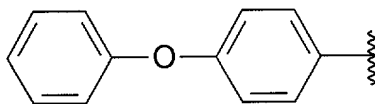


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81. The epoxy composition according to Claim 76 wherein -R is

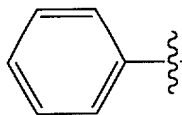


82. The epoxy composition according to Claim 76 wherein -R is



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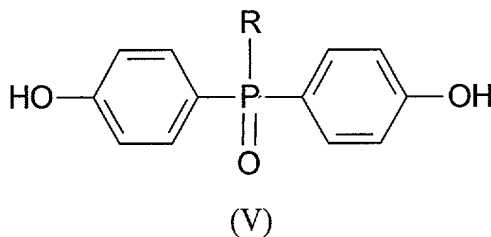
83. The epoxy composition according to Claim 76 wherein -R is



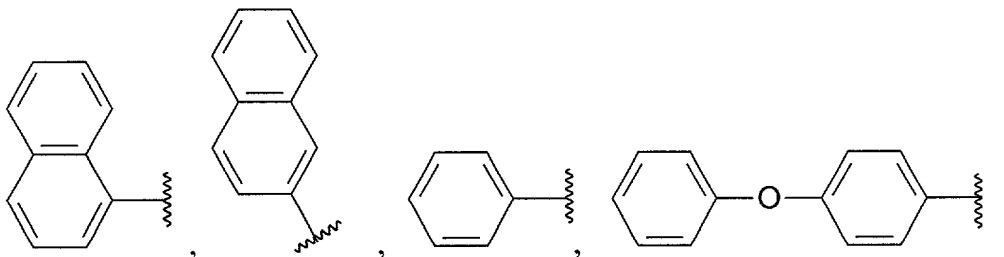
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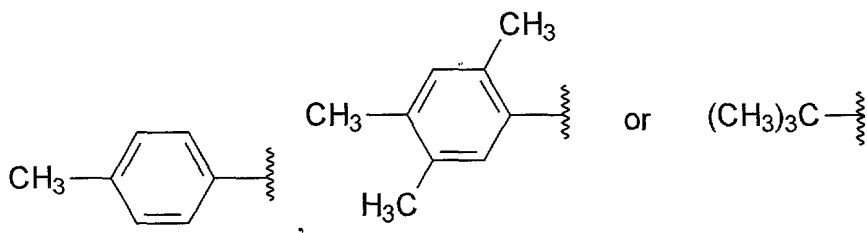
84. The epoxy composition according to Claim 76 wherein the epoxy resin is derived from bisphenol A.
85. The epoxy composition according to Claim 76 wherein the epoxy resin is derived from bisphenol F.
86. The epoxy composition according to Claim 76 wherein the epoxy resin is epoxy novolak resin.
87. A flame retardant epoxy composition comprising the epoxy composition of Claim 76, a curing agent and optionally including a filler and a diluent.
88. The flame retardant epoxy composition according to Claim 87, wherein said curing agent is selected from the group consisting of anhydrides, amines, amides, Lewis acids, and phenolic based novolak resins.
89. The flame retardant epoxy composition according to Claim 87, wherein said diluent comprises a glycidyl ether.
90. A resin-impregnated composite comprising reinforcing component and the flame retardant epoxy composition according to Claim 76, at least partially cured.
91. The resin-impregnated composite according to Claim 90, including a glass filler, a glass fiber or a glass fabric.
92. The resin-impregnated composite according to Claim 91, wherein said composite includes a glass fabric.

93. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 90.
94. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 91.
95. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 92.
96. The laminate according to Claim 95, wherein said laminate includes a plurality of layers of resin-impregnated glass fabric, press-formed into a substantially integrated structure generally inseparable into its constituent layers.
97. A curable epoxy composition including a component derived from a bis(hydroxyphenyl)phosphine oxide of the formula:



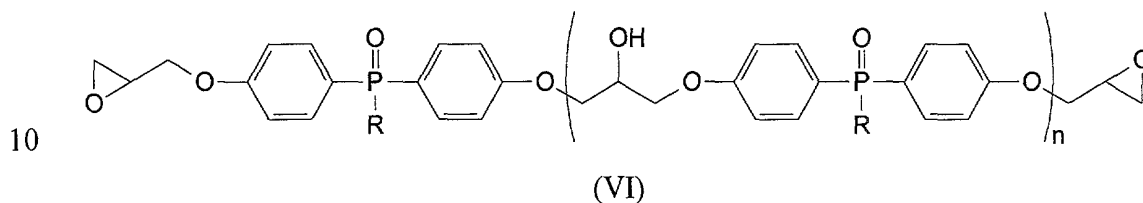
- wherein -R is selected from the group consisting of





by way of reaction with:

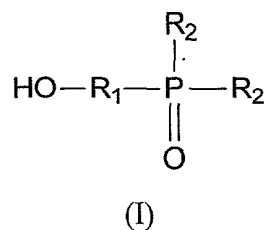
- 5 (i) epichlorohydrin or
- (ii) a diglycidyl ether or polyglycidyl ether, optionally including a diglycidyl ether of bisphenol A or a diglycidyl ether of the formula:



wherein n is an integer from 0 to 100, and R is defined as above, or

- 15 (iii) a mixture of glycidyl ethers derived from a mixture of hydroxyarylphosphine oxides, said mixture of hydroxyarylphosphine oxides comprising:

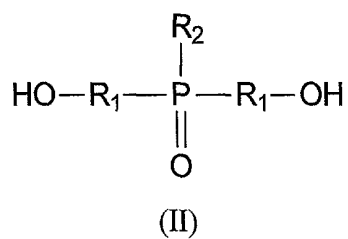
(a) a mono(hydroxyaryl)phosphine oxide of the formula:



wherein R_1 is a divalent, substituted or unsubstituted arylene moiety and
 R_2 is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl
 moiety or is an aralkyl moiety; and

5

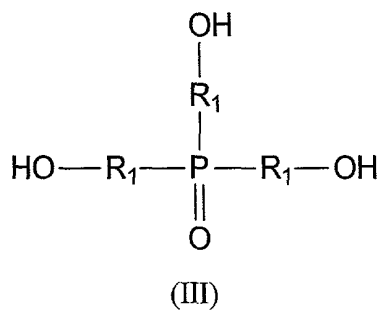
(b) a bis(hydroxyaryl)phosphine oxide of the formula:



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wherein R_1 and R_2 are defined as above; and

(c) a tris(hydroxyaryl)phosphine oxide of the formula:

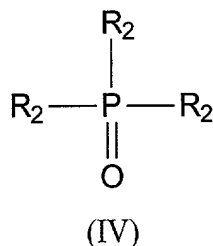


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wherein R_1 is defined as above; and

20

(d) optionally containing minor amounts of a pentavalent phosphine oxide of
 the formula:



wherein R_2 is defined as above,

5

optionally including an additional epoxy resin component.

98. The curable epoxy composition according to Claim 97 wherein n is an integer from 0 to 20.

10

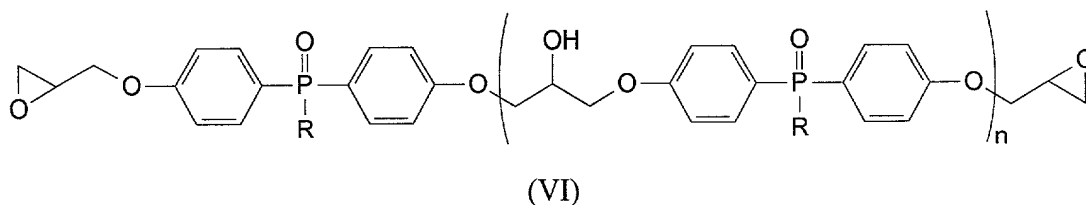
99. The curable epoxy composition according to Claim 97 wherein n is an integer from 0 to 5.

100. The curable epoxy composition according to Claim 97 which is derived from the reaction of said bis(hydroxyphenyl)phosphine oxide with diglycidyl ether of bisphenol A or bisphenol F or an epoxy novolak resin.

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101. The curable epoxy composition according to Claim 97 including a component which is derived from the reaction of said bis(hydroxyphenyl)phosphine oxide with diglycidyl ether of the formula:

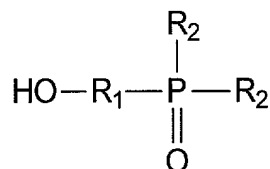
20



wherein n and R are defined as above.

102. The curable epoxy composition according to Claim 97 including a component which is derived from the reaction of said bis(hydroxyphenyl)phosphine oxide with a mixture of glycidyl ethers derived from a mixture of hydroxyarylphosphine oxides by way of reacting said mixture of hydroxyarylphosphine oxides with epichlorohydrin, said mixture of hydroxyarylphosphine oxides comprising:

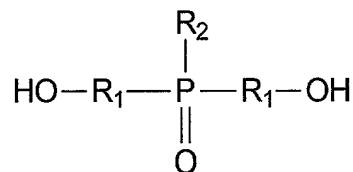
(a) mono(hydroxyaryl)phosphine oxide of the formula:



(I)

wherein R₁ is a divalent, substituted or unsubstituted arylene moiety and R₂ is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

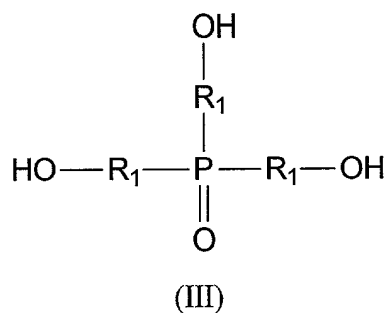
(b) a bis(hydroxyaryl)phosphine oxide of the formula:



(II)

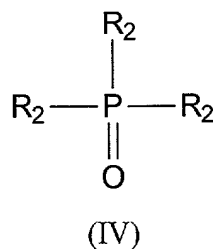
wherein R₁ and R₂ are defined as above; and

(c) a tris(hydroxyaryl)phosphine oxide of the formula:



wherein R₁ is defined as above; and

(d) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:

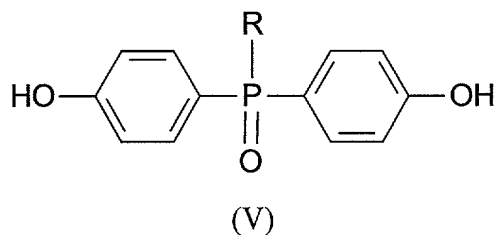


wherein R₂ is defined as above.

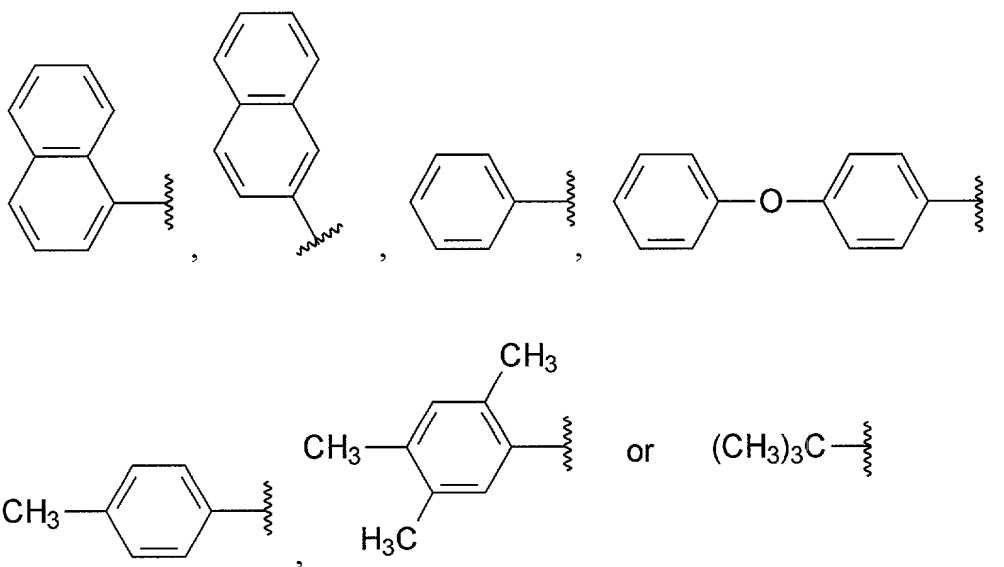
103. A flame retardant epoxy composition comprising the curable epoxy composition of Claim 97, a curing agent and optionally including a filler and diluent.

104. The flame retardant epoxy composition according to Claim 103, wherein said curing agent is selected from the group consisting of anhydrides, amines, amides, Lewis acids, and phenolic based novolak resins.

105. The flame retardant epoxy composition according to Claim 103, wherein said diluent comprises a glycidyl ether.
- 5 106. A resin-impregnated composite comprising a reinforcing component and the flame retardant epoxy composition according to Claim 103, at least partially cured.
- 10 107. The resin-impregnated composite according to Claim 106, including a glass filler, a glass fiber or a glass fabric.
108. The resin-impregnated composite according to Claim 107, wherein said composite includes a glass fabric.
- 15 109. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 106.
110. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 107.
- 20 111. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 108.
112. The laminate according to Claim 111, wherein said laminate includes a plurality of layers of resin-impregnated glass fabric, press-formed into a substantially
25 integrated structure generally inseparable into its constituent layers.
113. An epoxy composition derived from a bis(hydroxyphenyl)phosphine oxide of the formula:



wherein -R is selected from the group consisting of



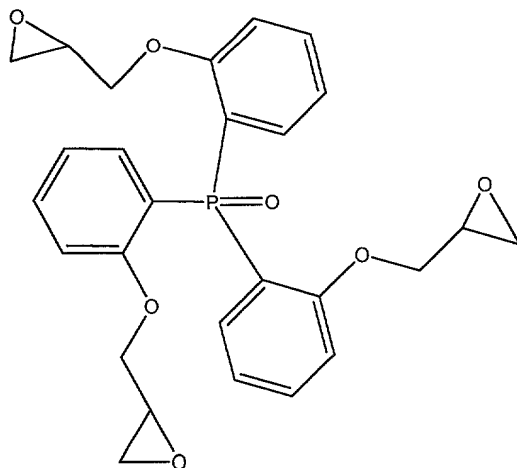
by way of reaction with an epoxy novolak resin or an epoxy resin of
epichlorohydrin and bisphenol A or bisphenol F.

114. A flame retardant epoxy composition according to Claim 113, further
comprising a curing agent and optionally including a filler and diluent.

115. The flame retardant epoxy composition according to Claim 114, wherein said
curing agent is selected from the group consisting of anhydrides, amines, amides,
Lewis acids, and phenolic based novolak resins.

116. The flame retardant epoxy composition according to Claim 114, wherein said diluent comprises a glycidyl ether.
- 5 117. A resin-impregnated composite comprising reinforcing component and the flame retardant epoxy composition according to Claim 114, at least partially cured.
118. The resin-impregnated composite according to Claim 117, including a glass filler, a glass fiber or a glass fabric.
- 10 119. The resin-impregnated composite according to Claim 118, wherein said composite includes a glass fabric.
120. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 117.
- 15 121. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 118.
122. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 119.
- 20 123. The laminate according to Claim 122, wherein said laminate includes a plurality of layers of resin-impregnated glass fabric, press-formed into a substantially integrated structure generally inseparable into its constituent layers.
- 25 124. A triglycidyl ether of the formula:

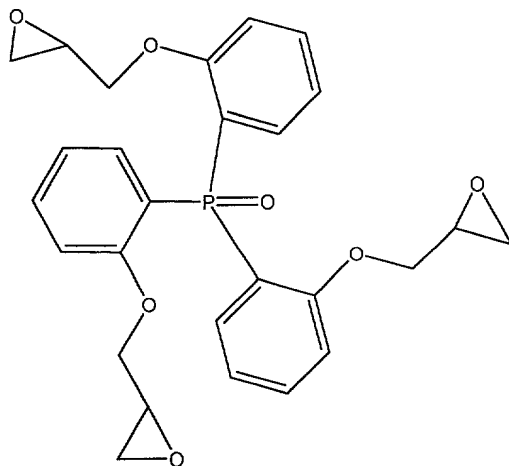
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125. A curable composition comprising:

5 a) at least one component taken from the group of:

(i) a tris(o-glycidyloxyphenyl)phosphine oxide generally of the formula:

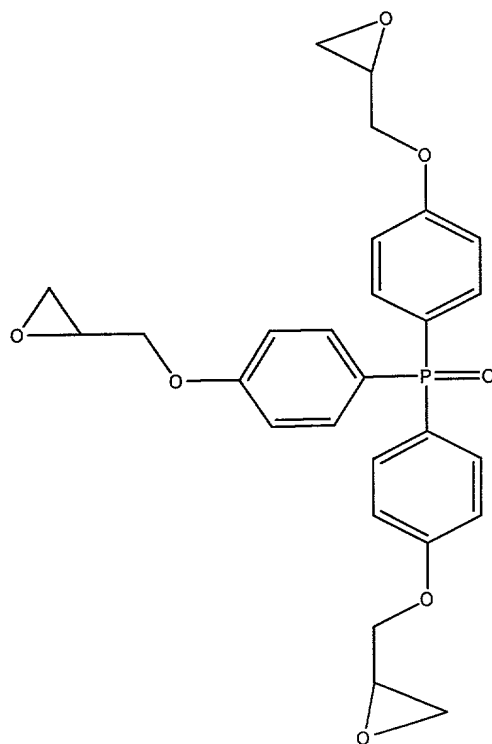


; and

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(ii) a tris(p-glycidyloxyphenyl)phosphine oxide generally of the formula:

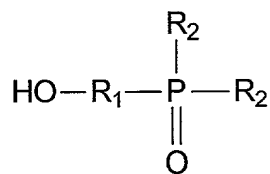
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b) optionally including a mixture of hydroxyarylphosphine oxides comprising:

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(i) a mono(hydroxyaryl)phosphine oxide of the formula:

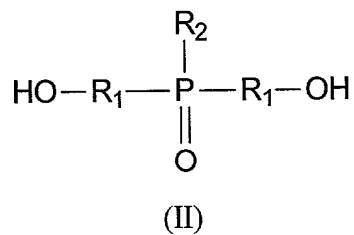


(I)

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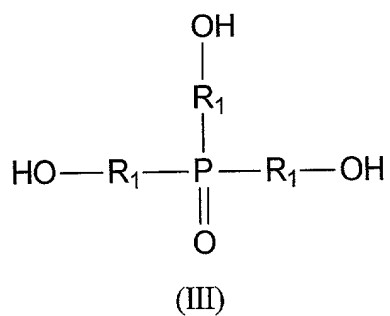
wherein R_1 is a divalent, substituted or unsubstituted arylene moiety and R_2 is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety; and

(ii) a bis(hydroxyaryl)phosphine oxide of the formula:



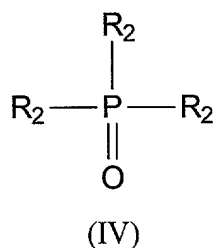
wherein R_1 and R_2 are defined as above; and

(iii) a tris(hydroxyaryl)phosphine oxide of the formula:



wherein R_1 is defined as above; and

(iv) optionally containing minor amounts of a pentavalent phosphine oxide of the formula:

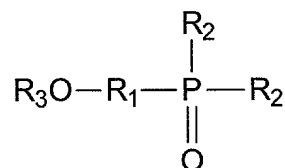


5 wherein R_2 is defined as above; and

- 10 c) at least one additional curable epoxy resin component optionally including epoxy resins derived from epichlorohydrin and hydroxyaryl compounds such as bisphenol A, Novolak resins, epoxy cresol-Novolak resins and mixtures thereof.
126. A flame retardant epoxy composition comprising the curable composition of Claim 125, a curing agent and optionally including a filler and a diluent.
- 15 127. The flame retardant epoxy composition according to Claim 126, wherein said curing agent is selected from the group consisting of anhydrides, amines, amides, Lewis acids, and phenolic based novolak resins.
128. The flame retardant epoxy composition according to Claim 126, wherein said
20 diluent comprises a glycidyl ether.
129. A resin-impregnated composite comprising a reinforcing component and the curable composition according to Claim 125, at least partially cured.
- 25 130. The resin-impregnated composite according to Claim 129, including a glass filler, a glass fiber or a glass fabric.

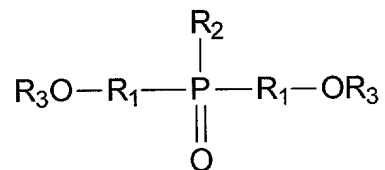
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131. The resin-impregnated composite according to Claim 130, wherein said composite includes a glass fabric.
132. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 129.
133. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 130.
134. A laminate, optionally including a copper foil layer adhered to the resin-impregnated composite of Claim 131.
135. The laminate according to Claim 134, wherein said laminate includes a plurality of layers of resin-impregnated glass fabric, press-formed into a substantially integrated structure generally inseparable into its constituent layers.
136. A mixture of alkoxyarylphosphine oxides comprising:
- (a) a mono(alkoxyaryl)phosphine oxide of the formula:



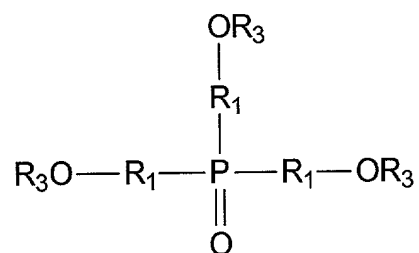
wherein R₁ is a divalent, substituted or unsubstituted arylene moiety; R₂ is a monovalent, substituted or unsubstituted aryl moiety or is an alkyl moiety or is an aralkyl moiety and R₃ is a C₁-C₆ aliphatic radical; and

(b) a bis(alkoxyaryl)phosphine oxide of the formula:



5 wherein R₁, R₂ and R₃ are defined as above; and

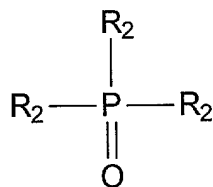
(c) a tris(alkoxyaryl)phosphine oxide of the formula:



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 wherein R₁ and R₃ are defined as above; and

(d) optionally containing minor amounts of a pentavalent phosphine oxide of
15 the formula:



 wherein R₂ is defined as above.

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